

## WHAT IS CLAIMED IS:

1. An electrical current collector system comprising:
  - an electrically conductive slip ring mounted to a rotatable shaft;
  - a fixed conducting ring assembly forming a partially enclosed AC high voltage electrical current conductive ring channel in which slip ring contacting members are mounted;
  - a compartment at ground potential for at least partially enclosing the slip ring and the fixed conducting ring assembly;
  - a source which directs a fluid into the conductive ring channel to perform at least one of cooling and cleaning of and the slip ring contacting members; and,
  - a hollow conically shaped insulator having a frustum with a narrower cross-sectional opening connected to the conductive ring channel and a larger diameter cross-sectional portion passing through and connected to the compartment for exhausting the fluid from the current conductive ring channel.
2. The apparatus of claim 1 wherein the slip ring and fixed conducting ring assembly are mounted to have a gap formed therebetween and wherein the source directs the fluid into the compartment so that the fluid travels through the gap and into the conductive ring channel to additionally perform at least one of cooling and cleaning of an interface of the slip ring.
3. The apparatus of claim 1 wherein the insulator continues to extend in a widening conical shape to an outlet port located beyond the compartment.
4. The apparatus of claim 3 wherein the insulator has a diameter that increases beyond the compartment.
5. The apparatus of claim 4 wherein the insulator has an inside wall portion that has a convex curvature beyond the compartment.
6. The apparatus of claim 3 further including a collection chamber mounted to the compartment outer wall and surrounding a portion of the insulator that extends beyond the compartment, and the collection chamber having a filter spaced from and across the outlet port of the insulator for filtering particles from the fluid as the fluid passes through the filter.

7. The apparatus of claim 1 wherein the insulator is slidably connected to the conductive ring channel.

8. The apparatus of claim 1, wherein the slip ring contacting members are brushes.

9. The apparatus of claim 2, further comprising a slip ring support assembly comprising plural post insulators spaced radially about the rotatable shaft for attaching the conductive slip ring to the rotatable shaft, and wherein the source directs the fluid over at least some of the post insulators for cleaning of the post insulators prior to directing the fluid through the gap.

10. The apparatus of claim 1, wherein the source of the fluid is a fan.

11. The apparatus of claim 1, wherein the conductive ring channel directs the fluid in at least a partially semicircular path to the hollow conically shaped insulator.

12. The apparatus of claim 1, wherein the fixed conducting ring assembly comprises a first conducting plate and a second conducting plate positioned parallel to one another to form a conductive ring channel therebetween, and wherein the slip ring contacting members are mounted in the conductive ring channel.

13. The apparatus of claim 12, wherein at least some of the slip ring contacting members are mounted on the first conducting plate and at least others of the slip ring contacting members are mounted on the second conducting plate.

14. The apparatus of claim 12, wherein the slip ring contacting members are mounted in pairs in the fixed conducting ring assembly, one slip ring contacting member of each pair being mounted on the first conducting plate and another slip ring contacting member of each pair being mounted on the second conducting plate.

15. A rotating transformer system comprising:  
a rotor assembly having rotor windings which rotates about a rotatable shaft;

a stator having stator windings;

a motor for rotating the rotor assembly;

a high voltage current collector system through which current is applied to the rotor assembly, and wherein the high voltage current collector system comprises:

an electrically conductive slip ring mounted to a rotatable shaft;

a fixed conducting ring assembly forming a partially enclosed current conductive ring channel in which slip ring contacting members are mounted;

a compartment at ground potential for at least partially enclosing the slip ring and the fixed conducting ring assembly;

a source which directs a fluid into the conductive ring channel to perform at least one of cooling and cleaning of an interface of the slip ring and the slip ring contacting members; and,

a hollow conically shaped insulator having a frustum with a narrower cross-sectional opening connected to the conductive ring channel and a larger diameter cross-sectional portion passing through and connected to the compartment for exhausting the fluid from the current conductive ring channel.

16. The apparatus of claim 15 wherein the slip ring and fixed conducting ring assembly are mounted to have a gap formed therebetween and wherein the source directs the fluid into the compartment so that the fluid travels through the gap and into the conductive ring channel to additionally perform at least one of cooling and cleaning of an interface of the slip ring.

17. The apparatus of claim 15 wherein the insulator continues to extend in a widening conical shape to an outlet port located beyond the compartment.

18. The apparatus of claim 17 wherein the insulator has a diameter that increases beyond the compartment.

19. The apparatus of claim 18 wherein the insulator has an inside wall portion that has a convex curvature beyond the compartment.

20. The apparatus of claim 17 further including a collection chamber mounted to the compartment outer wall and surrounding a portion of the insulator that extends beyond the compartment, and the collection chamber having a filter spaced from and across the outlet port of the insulator for

filtering particles from the fluid as the fluid passes through the filter.

21. The apparatus of claim 15 wherein the insulator is slidably connected to the conductive ring channel.

22. The apparatus of claim 16, wherein the gap is an annular gap.

23. The apparatus of claim 16, wherein the slip ring contacting members are brushes.

24. The apparatus of claim 16, further comprising a slip ring support assembly comprising plural post insulators spaced radially about the rotatable shaft for attaching the conductive slip ring to the rotatable shaft, and wherein the source directs the fluid over at least some of the post insulators for cleaning of the post insulators prior to directing the fluid through the gap.

25. The apparatus of claim 15, wherein the source of the fluid is a fan.

26. The apparatus of claim 25, wherein the conductive ring channel directs the fluid in at least a partially semicircular path to the hollow conically shaped insulator.

27. The apparatus of claim 15 wherein the fixed conducting ring assembly comprises a first conducting plate and a second conducting plate positioned parallel to one another to form a conductive ring channel therebetween, and wherein the slip ring contacting members are mounted in the conductive ring channel.

28. The apparatus of claim 27, wherein at least some of the slip ring contacting members are mounted on the first conducting plate and at least others of the slip ring contacting members are mounted on the second conducting plate.

29. The apparatus of claim 27, wherein the slip ring contacting members are mounted in pairs in the fixed conducting ring assembly, one slip ring contacting member of each pair being mounted on the first conducting plate and another slip ring contacting member of each pair being mounted on the second conducting plate.